

Data Presentation of Computer Course Ranking in Nursing College using SQL and Data Analysis at Tobruk University

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ABSTRACT

Research used quantitative with natural experiment research design for analysis of respondent performance in Computer course compared to other courses. The study present tables and figures of data as a result of extraction by SQL and data analysis using the ranking of Computer course in Nursing College of Tobruk University from the final grade of 3rd year student of academic year 2021-2022 and 2022-2023. The result of the study shows the ranking of the course. The paired t-test for Computer and Average grade AY 2021-2022 has a correlation of 0.896282, a p-value of 0.000237, and AY 2022-2023 has 0.819637 and 0.0078 respectively, both showing significant difference, and Computer course is above the Average grade. ANOVA on courses compared for AY 2021-2022 at 9.160967 and AY 2022-2023 of 11.84815, have p-value below 0.000001, showing significant difference in terms of average.

Keywords: Computer; Database; Data presentation; SQL; Data Analysis; Application.

1. Introduction

Structured query language or SQL is a computer language for relational database management and data manipulation [1], it is the main programming language designed to manage data stored in database systems [2]. A tool that can be used for data mining, which is a technology used to extract meaningful information and to develop significant relationship among variables stored in a data set [3, 4], by using aggregation and computation of fields where resulting query are subjected to filtering and Pivots [5], including but not limited to sum(), avg(), min(), max() and count() or even a user defined calculation [6]. Pivoting can help in evaluating an aggregated tabular format for a summarized data set [7]. On the other hand, nursing Informatics had scope and roles that constantly evolved and nurses, leaders and organizations were required to acclimate to increasing demands that these changes bring, as every new knowledge emerges and technologies being implemented into practice [8]. Informatics shapes public health recording and analysis of data [9]. A sub branch of public health informatics which is defined as the systematic application of information, computer science and technology in areas of public health, including surveillance, prevention, preparedness, and health promotion [10], with a main application promoting the health of the whole population [11, 12]. As of 2016, the first batch of 3rd year students of the new curriculum took Computer Application with Nursing Informatics [13], although the current curriculum took effect on Academic Year 2021-2022, with the addition of Medical Terminology making English Language 3 obsolete. With the creation and implementation of TUCON-GSv2 [14] the extraction of data in the system will be used to present the data together with some SQL code, furthered by data analysis in spreadsheet to meet the objective of the study.

2. Objectives of the study

The objective of the study is to present tables and figures of data as a result of extraction by SQL and data analysis using the ranking of Computer course in Nursing College of Tobruk University. *Scope of the study* includes the

final grade of 3rd year student of academic year 2021-2022 and 2022-2023 in the 1st semester. *Expected result of the study* is to show the ranking of the course via presentation of data using SQL technique for extraction and data analysis for statistics.

3. Materials and methods

The research employs the use of quantitative with natural experiment research design for analysis of respondent performance in Computer course and compared to other courses offered on the same semester. Population respondents will be the 3rd year students of College of Nursing from Tobruk University in the 1st semester of school year 2021-2022 and 2022-2023. The data will be extracted in TUCON-GSv2 database using a query, then will be presented in figures with charts, tabular data, and further statistics using data analysis of spreadsheet. The study aims to find out the nursing student's ranking in Computer course in the last 2 school year and present the data with SQL and data analysis. The two school year were selected as it is the current curriculum were all six courses were offered. These includes Renal System, Cardiopulmonary System, Intensive Nursing Practicum 1, Computer Application, Medical Terminology (replaced English Language 3 since 2021), and Pediatrics Nursing.

3.1. Study Population

The respondents consisted of 45 nursing students from 2021-2022 and 34 students from 2022-2023. To qualify as respondents the students must took all the courses from the said school year and semester in 3rd year level. Students who was unable to complete one course out of the six offered were removed from the respondents.

3.2. Research Tools/Instrument

The researcher uses the final grade of the students for all six courses as the basis of students' performance. The result will come from their final grade of 1st assessment, result of the removal exam was excluded.

3.3. Data Measures

Data will first be extracted from the database of the College, then the queried result will be tallied and organized in table. Weighted mean for each course as well as overall average will be presented together with standard deviation. Ranking will be given in descending order, with the highest average given a ranking of 1, followed by 2 and so on, there were no tie in the result. Frequency distribution was also used to count the passing and the failing marks. Both Computer and Medical Terminology was not considered as core subjects and has a passing mark of 50, while the rest has a passing mark of 60. These table were also presented in chart, created using the query extracted from the database. For data analysis paired t-test and Pearson product moment coefficient were used between Computer course and average grade. ANOVA was also used to get the difference in the variance between the different courses.

3.4. Software Tools

The researchers used SQL on TUCON-GSv2 for data extraction, including report design for creation of the figures. Microsoft Excel was used as a tally sheet and permit the data to be computed using function average for mean, stdev for standard deviation sample size. Tallied values also underwent data analysis tool pack t-test, and one way ANOVA.

4. Result

The result started by gathering data from the database of TUCON-GSv2, shown on figure 1 is the splash screen of the College's Grading system. After gathering and selecting the intended respondents data extraction follows.

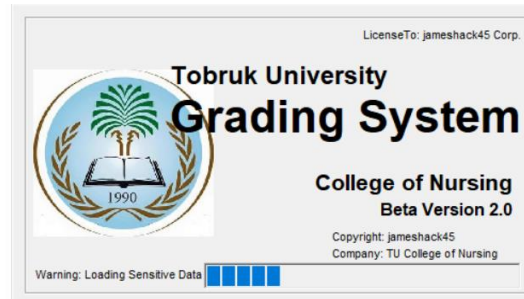


Figure 1. Splash Screen of TUCON-GSv2

4.1. Data Extraction

```
SELECT stud_info.[Control No], stud_info.Stud_Name, stud_info.Level, stud_records.Course_code,
Subject_tb.Subject, stud_records.midterm AS Duty, stud_records.Cs, stud_records.Lab AS [Lab/CP],
stud_records.Finals, Iif([lab_units]>0,[Midterm]+[cs]+[Lab]+[finals],[midterm]+[cs]+[finals]) AS Grade,
stud_records.[2nd], Iif([2nd]=-1,-1,Iif([2nd]=0,[grade],Iif([lab_units]>0 And [stud_records.SY]>="20162017"
Or [stud_records.SY]<"20132014",[lab]+[2nd],[2nd]))) AS [Final Grade], Iif((([Final grade]>=50 And
([description]="Minor Subject") Or [final grade]>=50 And [description]="") Or ([final grade]>=60 And
[description]="Major Subject"),"Passed-ناجح","Failed-راسب") AS status
FROM (stud_info INNER JOIN stud_records ON stud_info.[Control No] = stud_records.[Control No]) INNER
JOIN Subject_tb ON stud_records.Course_code = Subject_tb.Course_code
WHERE (((stud_records.code)="y3s1") AND ((stud_records.SY)="20212022") AND
((stud_records.sem)="1st"))
ORDER BY Subject_tb.Subject, stud_info.[List No];
```

Figure 2. Query to extract data from Academic Year 2021-2022

Figure 2 shows the SQL code used to extract fields and data from the table of the database. It includes fields from the students' information table where personal data of students were recorded, the subject table where the official curriculum for every semester were located and the grades table, to gather the class standing of students, it also includes major exam from midterm to finals and any other fields related to subjects with or without laboratory and clinical data. Query is computed as [Grade] equals the sum of [Midterm], [cs], [Lab] and [finals], for subjects with laboratory, for purely theory courses [Lab] grade was excluded in the sum of [Grade]. Using Iif() statement of SQL, a condition for removal exam was set as [2nd], where subjects with laboratory accepts 80% of the removal exam and retaining the 20% provision for [Lab] grade, while non-laboratory courses accepts 100% of removal exam result as the new [Final Grade]. "Major Subject" and "Minor Subject" were also met with condition as core subjects has a passing mark of 60, while minor course has 50. Inner join was used to join all tables, referencing the [Control No] of students, and [Course_code]. The where clause called for the text "y3s1" meaning 3rd year 1st semester and

[SY]="20212022" was used to call school year 2021-2022. The data was also arranged using ORDER BY clause according to the [List No] of students upon their enrollment to the course. [Midterm] field was also renamed as [Duty] for courses with clinical hours.

```
SELECT stud_info.[Control No], stud_info.Stud_Name, stud_info.Level, stud_records.Course_code,
Subject_tb.Subject, stud_records.midterm AS Duty, stud_records.Cs, stud_records.Lab AS [Lab/CP],
stud_records.Finals, Iif([lab_units]>0,[Midterm]+[cs]+[Lab]+[finals],[midterm]+[cs]+[finals]) AS Grade,
stud_records.[2nd], Iif([2nd]=-1,-1,Iif([2nd]=0,[grade],Iif([lab_units]>0 And [stud_records.SY]>="20162017"
Or [stud_records.SY]<"20132014",[lab]+[2nd],[2nd]))) AS [Final Grade], Iif(((Final grade)>=50 And
([description]="Minor Subject") Or [final grade]>=50 And [description]="") Or ([final grade]>=60 And
[description]="Major Subject"),"Passed-ناجح","Failed-راسب") AS status
FROM (stud_info INNER JOIN stud_records ON stud_info.[Control No] = stud_records.[Control No]) INNER
JOIN Subject_tb ON stud_records.Course_code = Subject_tb.Course_code
WHERE (((stud_records.code)="y3s1") AND ((stud_records.SY)="20222023") AND
((stud_records.sem)="1st"))
ORDER BY Subject_tb.Subject, stud_info.[List No];
```

Figure 3. SQL code to extract data from Academic Year 2022-2023

Similarly the SQL code in figure 3, depicts the same description from figure 2, except we extract data from [SY] "20222023". In addition on both figures, the [status] field shows "Passed" and "Failed" both in English and Arabic language. In the study the result will be using the data from [Grade] or the result from the 1st assessment, instead of [Final Grade] which was revised after the result of 2nd assessment of removal exam.

3rdyear1stsem20222023										
Level	Course_code	Subject	Duty	Cs	Lab/C	Finals	Grade	2nd	Final Gr	status
3	NURS303lyc	Intro to Computer Applicati	0	16	20	49	85	0	85	Passed-ناجح
3	NURS303lyc	Intro to Computer Applicati	0	18	19	47	84	0	84	Passed-ناجح
3	NURS303lyc	Intro to Computer Applicati	0	14	16	45	75	0	75	Passed-ناجح
3	NURS303lyc	Intro to Computer Applicati	0	7	5	39	51	0	51	Passed-ناجح
3	NURS303lyc	Intro to Computer Applicati	0	14	20	42	76	0	76	Passed-ناجح
3	NURS303lyc	Intro to Computer Applicati	0	12	19	41	72	0	72	Passed-ناجح
3	NURS303lyc	Intro to Computer Applicati	0	11	17	34	62	0	62	Passed-ناجح
3	NURS303lyc	Intro to Computer Applicati	0	11	18	39	68	0	68	Passed-ناجح
3	NURS303lyc	Intro to Computer Applicati	0	16	20	41	77	0	77	Passed-ناجح
3	NURS303lyc	Intro to Computer Applicati	0	13	12	39	64	0	64	Passed-ناجح
3	NURS303lyc	Intro to Computer Applicati	0	12	12	32	56	0	56	Passed-ناجح
3	NURS303lyc	Intro to Computer Applicati	0	14	17	41	72	0	72	Passed-ناجح
3	NURS303lyc	Intro to Computer Applicati	0	15	16	38	69	0	69	Passed-ناجح
3	NURS303lyc	Intro to Computer Applicati	0	9	17	35	61	0	61	Passed-ناجح
3	NURS303lyc	Intro to Computer Applicati	0	9	17	36	62	0	62	Passed-ناجح
3	LANG301ly	Medical Terminology 1	0	0	0	60	60	0	60	Passed-ناجح
3	LANG301ly	Medical Terminology 1	0	0	0	65	65	0	65	Passed-ناجح
3	LANG301ly	Medical Terminology 1	0	0	0	50	50	0	50	Passed-ناجح
3	LANG301ly	Medical Terminology 1	0	0	0	54	54	0	54	Passed-ناجح

Figure 4. Extracted data sample turned to query

In figure 4, the result of the query performed in figure 3 was shown in tabular form. [Duty] and [Lab/CP] will not work on subjects without laboratory or clinical hours even when you put a number on it. For simplicity, the original name of the course in the database Intro to Computer Application with Nursing Informatics will be simplified as Computer Application or Computer in the presentation of table and figures as would be seen in Tables 1-3 and figures' 5 and 6.

4.2. Computer Application Ranking

Table 1 shows the average performance of students for every course in the 1st Assessment of Academic year 2021-2022, where all current courses were offered together. In terms of mean, the highest ranked course is Intensive Nursing Practicum 1 with an average of 66.56 and S.D. of 9.30, this is followed by Renal System with 63.98, Computer Application has 63.96, Cardiopulmonary System with 63.98, Pediatrics Nursing at 52.18 and Medical Terminology 1 with 48.84.

Table 1. Performance and Subject Ranking of A.Y. 2021-2022

Subject	Mean	S.D.	Passed	Failed	%	Rank
Renal System	63.98	14.94	27	19	58.70	3
Cardiopulmonary System	61.24	17.79	22	24	47.83	4
Intensive Nursing Practicum 1	66.56	9.30	31	15	67.39	2
Computer Application	63.96	14.29	38	8	82.61	1
Medical Terminology 1	48.84	17.48	18	28	39.13	5
Pediatrics Nursing	52.18	19.89	13	33	28.26	6
Average Mean	60.17	-	18	28	39.13	-

Despite ranking 3rd in terms of mean Computer Application has a higher passing rate of 82.61, where 31 out of 45 successfully finished the course. The researchers would give a higher weight on the students completing the course during the semester so Rank 1 will be given to Computer Application and besides there is also a minimal difference between Computer and INP1 considering that INP1 is a core subject of the Nursing College. With an average mean of 60.17, the passing rate of 18 out of 45 is at 39.13%.

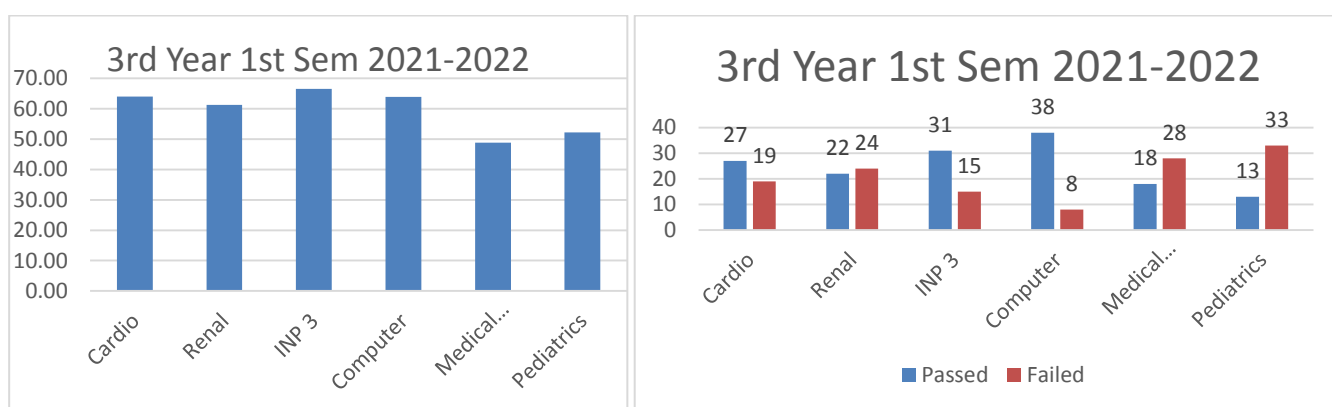


Figure 5. Graphical Chart of 3rd year A.Y. 2021-2022

The graphical presentation of the result of 3rd year AY 2021-2022 is shown in figure 5, on the upper bar chart it shows the mean score for every course, while the lower chart shows the frequency of passers and failures. The result on both chart and table only illustrates the result from 1st assessment, possible increase on the frequency, percentage and mean was imminent but would be excluded in the study to avoid possible outliers and fluctuation of results.

Table 2. Performance and Subject Ranking of A.Y. 2022-2023

Subject	Mean	S.D.	Passed	Failed	%	Rank
Renal System	49.03	17.37	8	26	23.53	5
Cardiopulmonary System	64.91	14.81	18	16	52.94	3
Intensive Nursing Practicum 1	69.38	9.84	30	4	88.24	1
Computer Application	63.71	14.18	27	7	79.41	2
Medical Terminology 1	56.47	14.50	21	13	61.76	4
Pediatrics Nursing	48.88	15.93	9	25	26.47	6
Average Mean	59.76	-	10	24	29.41	-

Table 2 shows the average performance of students for every course in the 1st Assessment of Academic year 2022-2023, the highest mean still belongs to Intensive Nursing Practicum 1 with an average of 69.38 and S.D. of 9.84, followed by Cardiopulmonary System with 64.38, Computer Application retained 3rd spot with 63.71, Medical Terminology 1 with 56.47, Cardiopulmonary System with 49.03, and Pediatrics Nursing at 48.88. Computer Application has a passing rate of 79.41, where 27 out of 34 successfully finished the course, which trails the INP1 with a passing rate of 88.24% on 30 out of 34 passers. Rank 2 would be given to Computer Application this time as despite the higher mark needed to pass in INP1, it was able to produce more passers compared to Computer. The average grade is at 59.76 where 10 out of 34 finishing the semester successfully or 29.41%, again the final result will be subject to change until the students took the removal exam.

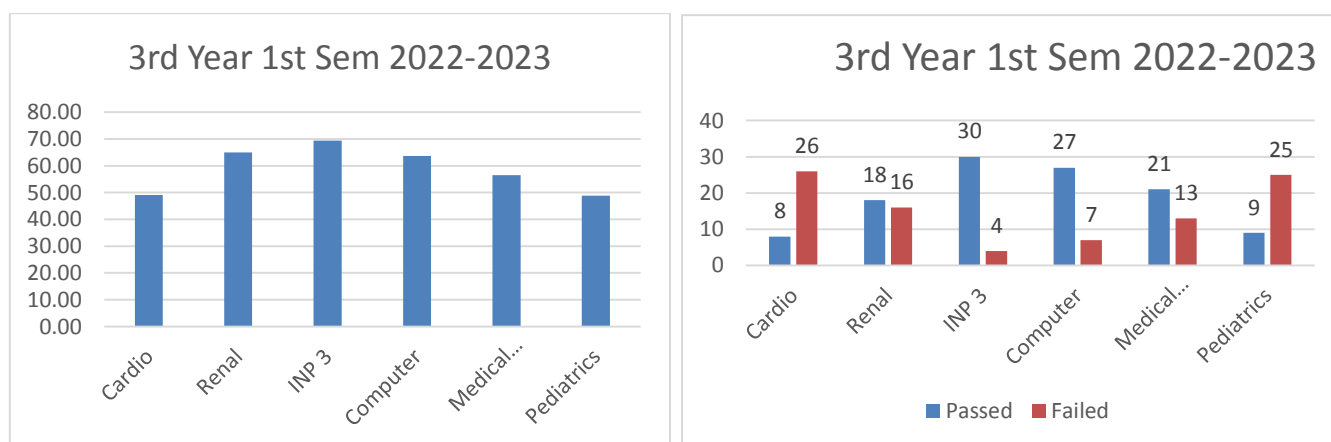


Figure 6. Graphical Chart of 3rd year A.Y. 20221-2023

As shown on figure 6, graphical data was presented for 3rd year AY 2022-2023, the average mean on the upper chart and frequency of passed and failed on the lower chart.

4.3. Differences in Responses

Table 3 shows the difference of mean using paired t-test for Computer and Average grade or GPA of students on the 1st semester class. For AY 2021-2022 Computer edge higher at 63.96 compared to Average grade, posing with a

very high correlation of 0.896282 via Pearson product moment coefficient, attesting that good performing students were also as good on average.

Table 3. Differences of Mean and Variance

A.Y.	Course	WM	Variance	Correl	t-stat	p value
A.Y. 2021-2022	Computer	63.96	14.29	0.896282	4.003153	*0.000237
	Average	60.17	12.90			
A.Y. 2022-2023	Computer	63.71	14.18	0.819637	2.833199	*0.0078
	Average	59.76	11.52			
A.Y.					F-Value	p value
A.Y. 2021-2022	Difference between all courses				9.160967	*<0.000001
A.Y. 2022-2023	Difference between all courses				11.84815	*<0.000001

The difference shows a t-stat of 4.003153 and a p-value of 0.000237 showing significant difference between the two means. Same thing could be said on the AY 2022-2023 where Computer is still higher than Average grade with 63.71 against 59.76, the correlation is very high at 0.819637 and t-stat and p-value of 2.833199 and 0.0078 showing significant difference between the pair. Using ANOVA on all the courses involve the F-value for AY 2021-2022 was at 9.160967 and AY 2022-2023 was 11.84815, both p-value is below 0.000001, or there are significant difference on the observed measures.

5. Conclusion

The paired t-test for Computer and Average grade AY 2021-2022 with a correlation of 0.896282 and a p-value of 0.000237 and paired t-test result for AY 2022-2023 correlation of 0.819637 and p-value of 0.0078 both shows significant difference between the pair, as both Computer course is above the Average grade in the semester. ANOVA on all the courses involve for AY 2021-2022 was at 9.160967 and AY 2022-2023 was 11.84815, where both p-value is below 0.000001, shows significant difference on the all courses involve in terms of average. The objective of the study to present tables and figures of data as a result of extraction by SQL and data analysis using the ranking of Computer course in Nursing College of Tobruk University was met. Inclusive of the final grade of 3rd year student of academic year 2021-2022 and 2022-2023 in the 1st semester the result of the study shows the ranking of the course via presentation of data using SQL technique for extraction and data analysis for statistics with the help of TUCON-GSv2 as well.

The result of the study would help in the improvement of the educational sector as well as to promote Computer Application with Nursing Informatics [5] not only as a basic subject but a key to nursing education as well [15] and together with the extracted data procedure. Using classification and clustering technique of data mining process would help predict future performance of students' and with that addressing their needs before an exam would improve their performance in the future and the quality of education in the College as to further the data mining

technique would help a lot [16]. The use of data mining in education may provide us with more varied and significant findings that would lead to an improved quality education [4]. The extracted result of the study would be useful element for promotion of quality education in the College [5, 14, 15]. As College of Nursing students of Tobruk University performed generally well in their academic subjects (in Computer in particular), a fruitful observation that students were suited up to the advancement of technology in the future generation may be seen. Further study was needed to address factors that may affect the result [15, 5]. TUCON-GSv2 database can generate helpful data and turn it to a meaningful data in promoting even a simple educational data mining for the improvement of quality education in the College [14]. Advance data mining approach together with proper elements would further improved data result transformation and the research as a whole [5].

Declarations

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This research did not receive any specific grant from funding agencies in the public, or not-for-profit sectors.

Competing Interests

The authors declare no competing financial, professional and personal interests.

Consent for publication

We declare that we consented for the publication of this research work.

Availability of data and material

Authors are willing to share data and material according to the relevant needs.

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